Psychosocial determinants of depression in the communityof the elderly with cardiovascular disease.

Man Xu [a,1], Ruoling Chen [b,1], Bing Liu [c], Yun Chai [d], Dorothy D. Boer [e], Ping Hu [a], Zhi Hu [f]

[a] Key Laboratory of Environment and Health (HUST), Ministry of Education & Ministry of Environmental Protection, and State Key Laboratory of Environmental Health (Incubation), School of Public Health, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei, China
[b] Center for Health and Social Care Improvement (CHSCI), University of Wolverhampton, Wolverhampton, United Kingdom
[c] Center of Health Administration and Development Studies, Hubei University of Medicine, Shiyan, Hubei, China
[d] School of Public Health and Health Management, Hubei University of Medicine, Shiyan, Hubei, China
[e] English Language Teaching Department, Hubei University of Medicine, Shiyan, Hubei, China
[f] School of Health Administrations, Anhui Medical University, Hefei, China

Abstract

The co-morbidity of cardiovascular disease (CVD) and depression is quite frequent in old people, and some potential biological and behavioural mechanisms linking them have been reported. Yet the impact of psychosocial factors on depression in the elderly with CVD remains unclear. This study aimed to analyze the psychosocial determinants of depression in the elderly with CVD. Using the Geriatric Mental Status–Automated Geriatric Examination for Computer Assisted Taxonomy, a community-based household survey was performed in 2,199 elderly people from the Anhui cohort third-wave survey from 2007 to 2009 and an extended study in Hubei from 2010 to 2011. Multiple logistic regression analyses were employed to assess the influence of psychosocial factors on depression. Among them, the prevalence of depression was 4.77%. Three factors were associated with depression in elderly in the community: self-assessed physical health status, anything else severely upsetting and unpleasantness with relatives, friends, or neighbors. In particular, associations of psychosocial factors with depression were more evident in individuals with CVD. This study confirms several psychosocial determinants of depression and the impact of CVD on the associations among the elderly, which provides some clues for interventional strategies of late-life depression.

Keywords:

Geriatric Mental Status–Automated Geriatric Examination for Computer Assisted Taxonomy; Psychological status; Negative life events; Social network; Activities of daily living; Depression; Older people; Cardiovascular disease

1.Introduction

Depression is a complex public health problem and leads to global disease and economic burden (WHO,2014). Despite decades of widespread intervention and efforts to raise public awareness of depression, its prevalence rates were still stable (Ferrari et al., 2013).Cardiovascular disease (CVD) is often regarded as a frequent co-morbidity of depression (Chauvet-Gelinier et al., 2013; Gan et al., 2014; Ghaemmohamadi et al., 2017), and there is a bidirectional relationship between them (Chauvet-Gelinier et al., 2013; Hare et al., 2014). Coronary heart disease is present in 30% of patients with mood disorders (Chauvet-Gelinier et al., 2013), while depression can increase 30% risk of both coronary heart disease and myocardial infarction (Gan et al., 2014). Moreover, potential mechanisms linking depression and adverse cardiac outcomes include some plausible biological pathways, such as elevated inflammation and altered function in autonomic nervous system (Chauvet-Gelinier et al., 2013). Behavioral pathways are also involved, such as poor adherence to diet and medication treatments and a sedentary lifestyle (Chauvet-Gelinier et al., 2013).

Accumulated evidence among general older people has demonstrated associations of depression with some psychosocial elements, including unsatisfied one's quality of life, income and physical health (Davison et al., 2012; Feng et al., 2014), burden of more chronic diseases (Feng et al., 2014),greater levels of disability (Davison et al., 2012), negative life events (Chen et al., 2005; Feng et al., 2014), and social support (Glaesmer et al., 2011; Morikawa et al., 2013; Wang and Zhao, 2012). However, few psychosocial factors were reported to be associated with depression among older people with CVD. For example, depression was previously found to correlate with total scores of social support as well as two domains of subjective support and utilization among 81 Chinese elderly post-stroke patients (Zhang et al., 2011). Another cross-sectional study conducted among 1064 elderly subjects with hypertension living at home in China showed that individuals under conditions of illiteracy, experiencing a pronounced stressful life event, or having poor functional status were more likely to develop depression symptoms (Ma et al., 2015).

Therefore, further investigations on effects of self-rated psychological status, negative life events, social network, and activities of daily life among aged residents with CVD are warranted, particularly given that the presence of CVD is usually associated with loss of activities of daily living (ADL) and increased demands for more various support. Besides, to date, the majority of previous studies assessing depression were based on self-rated questionnaires, which could be easily influenced by participants' subjective consciousness. To fill in these gaps, our study illustrated the psychosocial determinants of depression among old adults with CVD. Among those patients, psychosocial factors were hypothesized to be associated with depression, although their impacts on depression would be partially overlapped or offset. Our findings would add clues for more feasible psychological intervention strategies for preventing and controlling late-life depression.

2. Methods

2.1. Study population

The study population consisted of elderly patients from two community-based household survey studies: the Anhui cohort 3rd wave survey and an extended study in Hubei province with a common research protocol (Chen et al., 2013).

2.1.1 The Anhui cohort 3rd wave survey

The methods of the Anhui cohort study have been fully described previously (Chen et al., 2008; Chen et al., 2014; Chen et al., 2013; Chen et al., 2004; Chen et al., 2005). In brief, to collect baseline data based on the residency list from the committees of the village and the district (wave 1), we randomly selected a sample of 3,336 rural and urban residents (aged≥60 years) who had lived for 5 years or longer in the survey districts of Anhui province during 2001 to 2003. As the survey was anonymous and the data was only used for scientific research, after some explanations about the purposes and contents of the survey with each participant or the closest adult care-giver, we obtained the permission for interview and oral informed consent. Ethical approval for the study was obtained from Anhui Medical University and the

Research Ethics Committee, University College London (Chen et al., 2005). One year after the baseline investigation, we re-examined 2,608 cohort members (wave 2). During 2007 to 2009, we conducted the 3rd wave survey and successfully followed up 1,757 surviving cohort members with a response rate of 82.4%.

2.1.2 An extended study in Hubei

During 2010 to 2011, we extended the project to include the Hubei province. Two researchers in this survey team were trained at Anhui Medical University and gained the experience of having undertaken several surveys in the old, and transferred these skills to local research team members (Chen et al., 2004; Chen et al., 2005). The survey was conducted in Maojian subdistrict in Shiyan, Hubei, aiming to recruit more than 500 participants in each community. Ethical approval for the study was obtained from the Research Ethics Committee of Hubei University of Medicine. In total, we successfully obtained 501 complete questionnaires among 560 participants with a response rate of 89.5%.

2.2. Interview and data collection

The main interview material contained a general health and risk factors record and the GMS questionnaire (Copeland et al., 1986). The general health and risk factors record, derived partially from the MRC-ALPHA study (Copeland et al., 1999) and the Scottish MONICA surveys (Chen and Tunstall-Pedoe, 2005), was used for collecting data on five aspects of participants in this study. Data obtained included:(1) demographic information,(2)self-assessed psychological aspects, (3) social network,(4) negative life events occurring in the past 2 years, (5) ADL, (6) CVD. Participants reported their level of difficulty in questions of ADL scale. The valid response was ‘no difficulty alone’ (score 0), ‘manages alone with difficulty’ (score 1), and ‘cannot do alone’ (score 2). The scale includes the following 14 items: t a bath or all-over wash, washing hands and face, putting on shoes and stockings/socks, doing up buttons and zips, dressing yourself other than the above, getting to and using the washroom, getting in and out of bed, feeding yourself, shaving (men) or doing up your hair (women), cutting your own toenails, getting upstairs and downstairs, getting around the house, going out alone and taking medicine. We asked each participant whether he

or she had a doctor diagnosis of hypertension, heart disease, stroke, angina and recorded as yes/no.Those who had any type of these diseases were defined as participants with CVD. Depression was defined using the Geriatric Mental State-Automated Geriatric Examination for Computer-Assisted Taxonomy (GMS-AGECAT) (Copeland et al., 1986), which was fully described previously for depression diagnosis (Chen et al., 2004; Copeland et al., 1986) and validated in China (Chen et al., 2004).

2.3. Statistical analysis

Pearson's $\chi 2$ tests were conducted to determine the distribution of depression according to demographic and psychological characteristics. Multiple logistic regression analysis was conducted in a full model to evaluate risk factors (psychosocial variables as independent variables and depression as the dependent variable) adjusting for demographic variables and CVD with a significant level of 0.05 to enter and to stay in the model. Subsequently, a stratification analysis was conducted in the multiple logistic regression analysis in the same model to separately assess associations of psychosocial variables with depression among participants classified by the presence of CVD.

Data analyses were performed using SPSS statistical package, version 20.0 (SPSS Inc., Chicago, IL, USA). Our missing data analysis procedures mainly involved data missing completely at random, and the method of missing data processing was conducted by replacing the missing values with the column mean / median (Engels and Diehr, 2003).

3. Results

3.1. Baseline characteristics of participants

Figure 1 presented the flow chart of the source of participants from the two communities for analysis. Of the 2199 participants, 105 (4.77%) was diagnosed with depression. Among all the participants, 1063 (48.34%) had one or more types of doctor-diagnosed CVD, including hypertension (37.79%), heart disease (19.33%),

angina (6.41%) and stroke (4.50%). Among participants aged 60-100 years（M=74.12; SD=7.09）in our study, 1174(53.39%) were female, 1124(51.11%) lived in urban districts, and 1127(51.25%) were illiterate. And 1066(48.48%) participants were peasants and 450 (20.46%) were manual laborers.

Significant differences in distributions of depression were found according to all the demographic and psychosocial variables, except for variables of good relationships with parents (χ^2=181.63, P=0.178). The prevalence of CVD was significantly different between depression and non-depression group (χ^2 = 5.06, P =0.024) (Table 1).

3.2. Associations of psychosocial factors with depression

Associations of depression with self-assessed physical health status and life events of anything else severely upsetting and unpleasantness with relatives, friends, or neighbors were significant among all the participants, after adjusting for gender, age, urban-rurality, education level , main occupation and CVD (Table 2).

3.3. Stratified analyses for association of psychosocial factors with depression

We subsequently conducted a stratification analysis in the participants by the presence of CVD. After adjusting for the same covariates as in the Table 2, associations of psychosocial factors with depression were separately found among participants with and without CVD. In participants with CVD, self-assessed physical health status, death of closely related person, and unpleasantness with relatives, friends, or neighbors were significantly associated with depression. But only the life event of anything else severely upsetting was associated with depression among participants without CVD (Table 3).

4. Discussion

In our study, the prevalence of depression was 4.77%, which was similar to that found in 7,072 community elderly from six provinces of China based on the same diagnosis procedure (Chen et al., 2013).As expected, the associations of depression with self-assessed psychological status and negative life events were confirmed among older people from the community. But more associations were only seen in old

patients with CVD than those without CVD, when participants were stratified by the presence of CVD. Those findings provide evidence on implications of several psychosocial determinants of depression and the impact of CVD on these associations in the older population, which offers some potential ways to reduce later-life depression.

4.1. Impact of psychosocial factors on depression in old people

Later lifetime is often featured by a series of loss experiences, such as bereavement, loss of functional role in society, and isolation due to chronic diseases (Stephens MA, 1990). In our study, the aged who experienced negative life events, such as unpleasant things with intimate friends, neighbors or relatives, or anything else severely upsetting, were more likely to suffer from depression. Devanand et al. (Devanand et al., 2002) conducted a survey of 50 American elderly outpatients and 40 health controls in an American Late-Life Depression clinic, and found that individuals with major depression reported higher prevalence of adverse life events about interpersonal conflicts than controls. Interpersonal conflicts included major problems with friends/neighbors and major family problems/conflicts other than with spouse. This study was in line with our results. But in a community survey of 654 aged residents in an district in London, end of relationship and problem with close friend or relative were not associated with pervasive depression (Prince et al., 1997). Some other similar studies just showed negative effect of stressful life events on later-life depression but life events were not assessed in specific types (Feng et al., 2014; Luppa et al., 2012). The inconsistent conclusions may be caused by differences in sample size, evaluation methods of life events and culture backgrounds of various countries. In addition, according to socioemotional selectivity theory (Carstensen, 1995), aging is associated with motivational shifts that greater importance is paid to current emotional goals rather than instrumental goals. To maximize their positive emotional experience and minimize their emotional risk in the limited life, old people would selectively narrow their social communication and pay more attention to people who are close to them. Unsurprisingly, old people who experienced the two emotional stressful events were more likely to develop depression in our study.

Also, our study found that community elderly people with poor self-assessed health status were more likely to have depression than those with satisfactory self-assessed health. Meanwhile, those with the presence of CVD or those with higher scores on dependency of ADL had a higher prevalence of depression. The results were in line with findings from two previous cross-sectional studies (Davison et al., 2012; Nicolosi et al., 2011). In a case-control study of 50 aged care residents with a diagnosis of major depressive disorder and 50 matched residents without depression, higher level of depressive symptoms was associated with poorer self-rated health, more chronic health problems and greater levels of disability (Davison et al., 2012). In another study of 303 Brazilian elderly in a poor subdistrict of the city, individuals with more depressive symptoms were those with poorer self-perceived health and more health problems (Nicolosi et al., 2011). However, compared with the above two studies, our study had available formal diagnosis of depression using GMS-AGECAT, while they just assessed the severity of depression by geriatric depression scales. In addition, our study was based on the general community dwelling elderly with much larger sample size, thus have more reliable conclusions.

Stratification analysis showed that associations of self-assessed physical health, death of closely related person, unpleasantness with relatives, friends, or neighbor with depression were more pronounced for aged adults with CVD. In fact, CVD often has a long disease course and requires daily care and long-term medications, during which negative consequences of the persistent complications, decline of physical functions, heavy financial burden, and increased dependence on people around may affect older CVD patients' self-rated health and cognitive functions (Ma et al., 2015; Zhang et al., 2017).Then, subsequent somatic dysfunction and emotional distress may trigger and exacerbate the onset and development of depression (Ma et al., 2015; Zhang et al., 2017). Meanwhile, such emotional stressful events could make them nervous, sad, and even contribute to a disturbing sense of helplessness or insecurity, thus may also result in depression when accumulated for a long time. Moreover, chronic mental stress is a probable common agitator underlying the co-morbidity between depression and cardiovascular pathology by shifting the homeostatic balance

in the autonomic nervous system (Halaris, 2013). Besides, for the elderly without CVD, only the life event of anything else severely upsetting was associated with depression. We may speculate that for the old without somatic and psychological consequences of CVD, only the life events that severely make one upsetting may put them into depression. These findings suggested that, compared with older adults without CVD, stressful life events and poor self-reported physical health were more likely to be risk factors of depression among old people with CVD. Although the underlying pathophysiological or psychosocial mechanisms are unclear, it is possible that suffering from CVD may make the old more susceptible to those emotional stressful events and poor self-rated health status, which ,to a great extent, facilitates the process of geriatric depression onset.

4.2. Implications for clinical practice

Depression and CVD are at present the two most common disease that cause disability in high-income countries and this trend is expected to expand for countries of all income levels by 2030 (WHO,2008). Strategies to alleviate depression in old population should be a combined effect of the whole society, the community and family members. On one hand, public health planners and practitioners need give more consideration to developing comprehensive disease management for the old, including timely screening of CVD and depression, cardiac rehabilitation and exercise, cognitive behavioral therapy and antidepressant medication (Hare et al., 2014). On the other hand, previous studies showed that worse family functioning and lower social support were negatively associated with depression in Chinese elderly (Wang and Zhao, 2012);family emotional involvement had a buffering effect on mental symptoms of Chinese community elderly with chronic medical diseases (Leung et al., 2007).Therefore, good family function and various social support (i.e., emotional or material support) from people around them should be necessarily needed for the elderly to maintain their emotional fulfillment. Especially, specific measures should be taken to reduce the severity of grief and depression for older patients who experienced death of closely related person. Physicians in primary care should pay more attention to recognizing and appropriately referring for their emotional distress

in the context of death of the close, as standard depression care management may not be effective (Ghesquiere et al., 2013; Ghesquiere et al., 2014). Only in this context could targeted psychosocial interventions be taken to reduce depression risk of the elderly.

4.3. Strengths and limitations

The main contribution of this study lies in demonstrating the impact of psychosocial variables on depression among older adults and explaining the role of CVD in these associations. Also, whereas other studies used questionnaires as a substitute for depression diagnosis, we conducted a standardized face-to-face interview and depression diagnostic system using the GMS-AGECAT package. However, some limitations should be mentioned. First, we defined medically CVD based on information obtained from participants or their closest caregivers instead of accessing medical records. This approach might underestimate the prevalence of CVD diagnosed by doctors, because participants may not recall whether they have been given a diagnosis or may be unwilling to disclose this information. We acknowledge that more robust information should have been obtained through checking relevant medical records. Secondly, most assumed risk factors were collected through self-assessment, such as self-assessed psychological status, social network, and adverse life events (as in many European studies). Hence, any of those could cause bias if adverse data was reported by depressed participants. In addition, the sample size was relatively small due to the low prevalence of depression in communities and the study was cross-sectional. Nevertheless, we were able to identify certain high-risk groups which might benefit from psychological interventions, but the causal relationship between depression, CVD and correlative psychosocial factors requires longitudinal studies with a larger sample size for confirmation.

4.4. Final conclusions

Our studies confirmed associations of depression with self-assessed psychological status and negative life events among older people from the community and found the impact of CVD on the associations. From this study, we can propose that what probably affects patients is not only those psychosocial determinants, but also the way

in which physical limitations alter their lives due to CVD. It is possible that psychosocial factors may act as a stress-physiology mediator, a node through which CVD exert influence on both physiological functions and mental health of the old. However, our cross-sectional study lacks evidence for causal relationship. Thus, more longitudinal researches are needed to establish the pathways.

Conflict of interest

None

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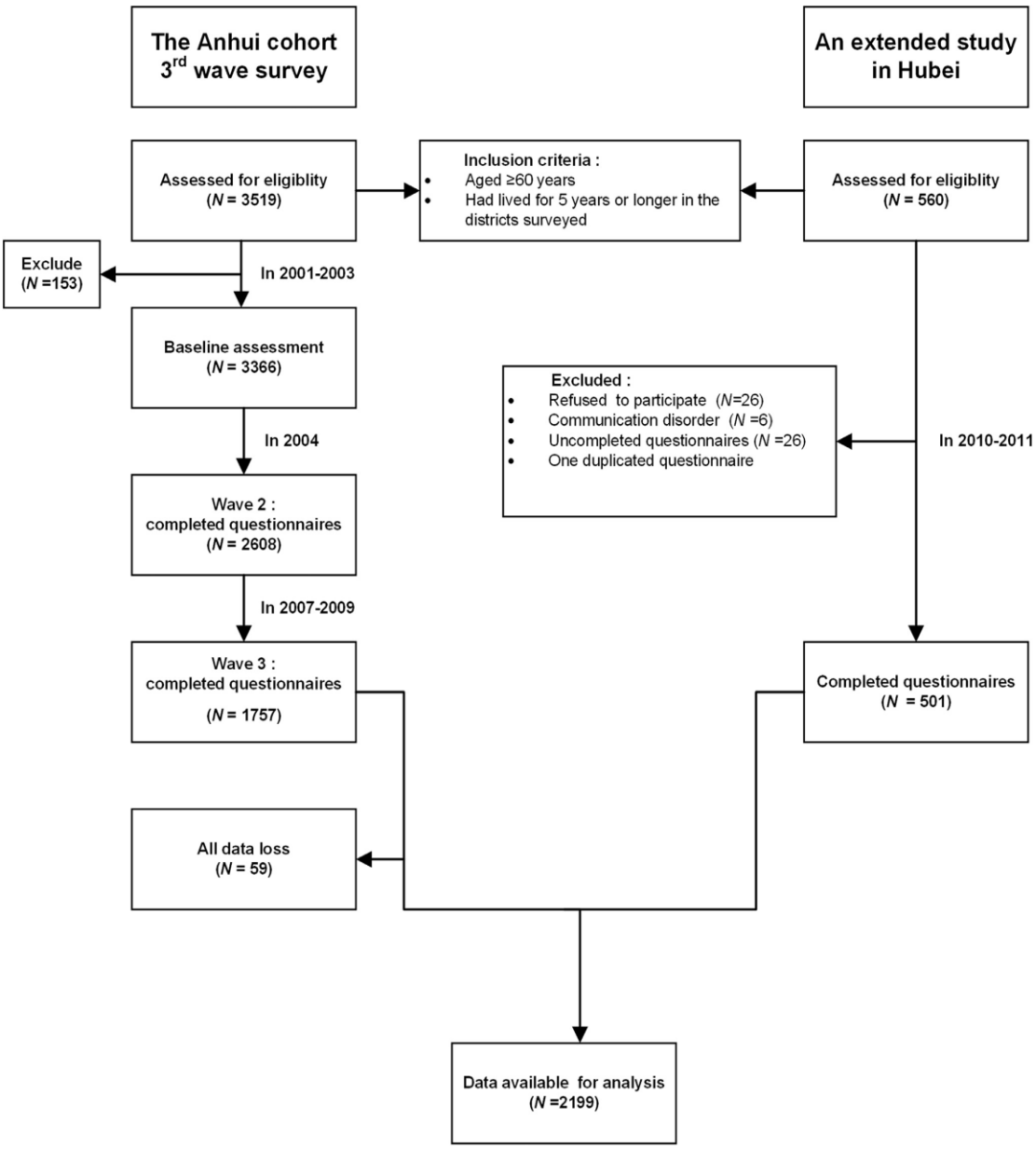

Figure 1. Flow chart of the elderly for analysis from two community-based surveys (N=2199)

Table 1. Distribution of depression according to demographic and psychosocial variables.

Variable	Non-depressed		Depressed		$\chi 2_{(df)}$	*P*
	n	%	*n*	%		
Demographic factors						
Urban-rurality						
Urban	1085	51.81	39	37.14	$8.61_{(1)}$	0.003
Rural	1009	48.19	66	62.86		
Gender						
Female	1102	52.63	72	68.57	$10.22_{(1)}$	0.001
Male	992	47.37	33	31.43		
Age(years)						
85-100	196	9.36	15	14.29	$3.8_{(2)}$	0.015
75-84	885	42.26	37	35.24		
60-74	1013	48.38	53	50.48		
Education level						
Illiterate	1061	50.67	66	62.86	$10.73_{(4)}$	0.030
Primary school	369	17.62	21	20		
Secondary school	301	14.37	7	6.67		
High secondary school	215	10.27	8	7.62		
College	148	7.07	3	2.86		
Main occupation						
Peasant	1004	47.95	62	59.05	$11.91_{(3)}$	0.008
Manual laborer	432	20.63	18	17.14		
Business/other (housewife)	252	12.03	17	16.19		
Officer/teacher	406	19.39	8	7.62		
Self-assessed psychological status						
Satisfaction with current life						
Poor	55	2.63	16	15.24	$65.37_{(2)}$	<0.0001
Fair	757	36.15	52	49.52		
Satisfactory	1282	61.22	37	35.24		
Self-assessed physical health status						
Poor	216	10.32	36	34.29	$64.43_{(2)}$	<0.0001
Fair	1019	48.66	51	48.57		
Good	859	41.02	18	17.14		
Satisfaction with current income						
Poor	135	6.45	26	24.76	$56.82_{(2)}$	<0.0001
Fair	952	45.46	52	49.52		
Satisfactory	1007	48.09	27	25.71		

(Continued)

Variable	Non-depressed		Depressed		$\chi 2_{(df)}$	*P*
	n	%	*n*	%		
Social network						
Living with						
Nobody	318	15.19	27	25.71	$8.38_{(1)}$	0.004
Family members /others	1776	84.81	78	74.29		
Marital status						
Widowed	84	4.01	5	4.76	$12.14_{(2)}$	0.002
Never married/divorced	493	23.54	40	38.1		
Married	1517	72.45	60	57.14		
Available help when needed						
No	93	4.44	14	13.33	$17.08_{(1)}$	<0.0001
Yes	2001	95.56	91	86.67		
Satisfaction with the help and support from others						
No	61	2.91	13	12.38	$2472.70_{(1)}$	<0.0001
Yes	2033	97.09	92	87.62		
Good relationships with others and ease in acquiring friends						
No	272	12.99	25	23.81	$10.02_{(1)}$	0.002
Yes	1822	87.01	80	76.19		
Good relationships with parents						
No	33	1.58	4	3.81	$181.63_{(1)}$	0.178
Yes	2061	98.42	101	96.19		
Good relationships with neighbors						
No	729	34.81	52	49.52	$9.45_{(1)}$	0.002
Yes	1365	65.19	53	50.48		
Negative life events						
A sudden decline of health status						
No	1604	76.6	60	57.14	$20.56_{(1)}$	<0.0001
Yes	490	23.4	45	42.86		
Serious financial problems						
No	1926	91.98	82	78.1	$24.29_{(1)}$	<0.0001
Yes	168	8.02	23	21.9		
Death of closely related person						
No	1790	85.48	77	73.33	$11.51_{(1)}$	0.001
Yes	304	14.52	28	26.67		

(Continued)

Variable	Non-depressed		Depressed		$\chi 2_{(df)}$	*P*
	n	%	*n*	%		
Something important lost or stolen						
No	2038	97.33	98	93.33	$438.20_{(1)}$	0.036
Yes	56	2.67	7	6.67		
Anything else severely upsetting						
No	1977	94.41	74	70.48	$91.26_{(1)}$	<0.0001
Yes	117	5.59	31	29.52		
Unpleasantness with relatives, friends, or neighbors						
No	2070	98.85	93	88.57	$5941.83_{(1)}$	<0.0001
Yes	24	1.15	12	11.43		
ADL						
ADL (scores)						
0	1696	80.99	74	70.48	$20.13_{(2)}$	<0.0001
1-4	282	13.47	14	13.33		
5-28	116	5.54	17	16.19		
CVD						
No	1093	52.2	43	40.95	$5.06_{(1)}$	0.024
Yes	1001	47.8	62	59.05		

Table 2. Associations between psychosocial factors and depression among the community elderly (*n*=2199).[‡]

Variable	OR(95%CI)
Self-assessed psychological status	
Satisfaction with current life	
Poor	2.02(0.75,5.45)
Fair	1.45(0.78,2.71)
Satisfactory	Reference
Self-assessed physical health status	
Poor	3.27(1.59,6.73)*
Fair	1.68(0.91,3.12)
Good	Reference
Satisfaction with current income	
Poor	2.18(0.94,5.06)
Fair	1.1(0.56,2.19)
Satisfactory	Reference
Social network	
Living with	
Nobody	1.52(0.85,2.72)
Family members /others	Reference
Marital status	
Never married	1.21(0.41,3.62)
Widowed (including several divorces)	1.39(0.81,2.37)
Married	Reference
Available help when needed	
No	0.83(0.29,2.39)
Yes	Reference
Satisfaction with the help and support from others	
No	2.41(0.79,7.36)
Yes	Reference
Good relationships with others and ease in acquiring friends	
No	0.9(0.48,1.67)
Yes	Reference
Good relationships with parents	
No	2.2(0.66,7.4)
Yes	Reference
Good relationships with neighbors	
No	1.16(0.71,1.9)
Yes	Reference

(continued)

Variable	OR(95%CI)
Negative life events	
A sudden decline in health status	
Yes	1.23(0.75,2)
No	Reference
Serious financial problems	
Yes	0.83(0.43,1.57)
No	Reference
Death of closely related person	
Yes	1.6(0.93,2.76)
No	Reference
Something important lost or stolen	
Yes	0.97(0.37,2.55)
No	Reference
Anything else severely upsetting	
Yes	3.04(1.64,5.62)**
No	Reference
Unpleasantness with relatives, friends, or neighbors	
Yes	4(1.55,10.31)*
No	Reference
ADL	
ADL (scores）	
1-4	0.84(0.44,1.6)
5-28	1.06(0.51,2.21)
0	Reference
CVD	
Yes	1.67(1.05,2.65)*
No	Reference

‡**Adjusted for the gender, age, urban-rurality, education level and main occupation.**

** ***P* < 0.001**

* ***P* < 0.05**

Table 3. Associations of psychosocial factors with depression stratified by CVD[‡].

Variable	Participants without CVD		Participants with CVD	
	N(% of total 1136)	*OR(95%CI) for depression*	*N (% of total 1063)*	*OR(95%CI) for depression*
Self-assessed psychological status				
Satisfaction with current life				
Poor	40(3.66)	2.75(0.64,11.8)	15(1.50)	1.21(0.22,6.68)
Fair	427(39.07)	1.2(0.45,3.18)	330(32.97)	2.17(0.88,5.32)
Satisfactory	626(57.27)	Reference	656(65.53)	Reference
Self-assessed physical health status				
Poor	91(8.33)	1.96(0.61,6.38)	125(12.49)	4.62(1.73,12.37) *
Fair	524(47.94)	1.31(0.53,3.25)	495(49.45)	2.25(0.92,5.52)
Good	478(43.73)	Reference	381(38.06)	Reference
Satisfaction with current income				
Poor	83(7.59)	3.25(0.77,13.73)	52(5.19)	1.55(0.49,4.9)
Fair	539(49.31)	2.01(0.64,6.26)	413(41.26)	0.58(0.22,1.53)
Satisfactory	471(43.09)	Reference	536(53.55)	Reference
Living with				
Nobody	174(15.92)	1.59(0.62,4.06)	144(14.39)	1.35(0.6,3.03)
Family members/others	919(84.08)	Reference	857(85.61)	Reference
Social network				
Marital status				
Never married	43(3.93)	2.21(0.46,10.67)	41(4.10)	0.65(0.11,3.78)
Widowed(including several divorces)	261(23.88)	0.93(0.38,2.28)	232(23.18)	1.78(0.87,3.64)
Married	789(72.19)	Reference	728(72.73)	Reference
Available help when needed				
No	46(4.21)	0.53(0.09,3.01)	47(4.70)	1.14(0.25,5.14)
Yes	1047(95.79)	Reference	954(95.30)	Reference
Satisfaction with the help and support from others				
No	31(2.84)	3.61(0.57,22.72)	30(3.00)	1.73(0.32,9.23)
Yes	1062(97.16)	Reference	971(97.00)	Reference
Good relationships with others and ease in acquiring friends				
No	155(14.18)	0.63(0.24,1.65)	117(11.69)	1.09(0.45,2.65)
Yes	938(85.82)	Reference	884(88.31)	Reference
Good relationships with parents				
No	19(1.74)	1.11(0.09,13.29)	14(1.40)	3.33(0.68,16.25)
Yes	1074(98.26)	Reference	987(98.60)	Reference
Good relationships with neighbors				
No	392(35.86)	1.69(0.78,3.68)	337(33.67)	0.89(0.45,1.76)
Yes	701(64.14)	Reference	664(66.33)	Reference

(Continued)

Variable	Participants without CVD		Participants with CVD	
	N(% of total 1136)	***OR(95%CI) for depression***	***N (% of total 1063)***	***OR(95%CI) for depression***
Negative life events				
A sudden decline of health status				
No	889(81.34)	1.18(0.51,2.75)	715(71.43)	1.29(0.69,2.39)
Yes	204(18.66)	Reference	286(28.57)	Reference
Serious financial problems				
No	1007(92.13)	0.43(0.13,1.37)	919(91.81)	1.41(0.63,3.16)
Yes	86(7.87)	Reference	82(8.19)	Reference
Death of closely related person				
No	958(87.65)	1.16(0.45,3.02)	832(83.12)	2.07(1.02,4.18) *
Yes	135(12.35)	Reference	169(16.88)	Reference
Something important lost or stolen				
No	1067(97.62)	2.37(0.67,8.37)	971(97.00)	0.16(0.02,1.5)
Yes	26(2.38)	Reference	30(3.00)	Reference
Anything else severely upsetting				
No	1041(95.24)	5.28(1.97,14.15)*	936(93.51)	2.17(0.91,5.15)
Yes	52(4.76)	Reference	65(6.49)	Reference
Unpleasantness with relatives,friends, or neighbors				
No	1082(98.99)	2.38(0.49,11.5)	988(98.70)	5.51(1.45,20.97)*
Yes	11(1.01)	Reference	13(1.30)	Reference
ADL				
ADL (scores)				
0	863(78.96)	0.7(0.24,2.04)	833(83.22)	0.92(0.38,2.21)
1-4	174(15.92)	1.61(0.5,5.16)	108(10.79)	1.01(0.37,2.74)
5-28	56(5.12)	Reference	60(5.99)	Reference

‡Adjusted for the gender, age, urban-rurality, education level and main occupation.

* $P < 0.05$